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## MEMORANDUM

**TO:** Patrick Goddard, Director of Facilities, Town of Lexington  
Paul B. Ash, Ph.D., Superintendent, Lexington Public Schools, Estabrook Advisory Committee

**FROM:** Matt A. Fragala, M.S., C.I.H., Senior Scientist  
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**DATE:** May 19, 2011

**RE:** Air Samples Collected on April 21 and 22, 2011, Estabrook Elementary School (EH&E 17228)

This memorandum provides results of the most recent air sampling at Estabrook Elementary School (Estabrook). The objective of the air testing was to measure levels of polychlorinated biphenyls (PCBs) in indoor air of classrooms that have been mitigated according to the interim measures and managed according to the Operation and Maintenance (O&M) Plan.

Details of the interim measures and other aspects of the current indoor environmental quality (IEQ) management plan are available in the Project Update memorandum dated October 28, 2010, and the materials distributed to the Superintendent's Advisory Committee on November 4, 2010. In addition, detailed plans on the operation of Estabrook are available in the O&M Plan dated January 29, 2011. In brief, a mini-wall was constructed in each room to encapsulate the lower panels of the curtain wall. The mini-wall separates the panels and associated PCB-containing materials from indoor air of the classroom. I-beam chases were enclosed and specific areas related to the curtain wall were sealed with new caulk or foam insulation. Areas sealed included edges of the mini-wall, metal-to-metal joints of aluminum framing, and original caulking at the intersection of horizontal and vertical aluminum frames. Interim measures were completed in Estabrook by the end of November 2010.

## AIR SAMPLE RESULTS

Air samples were collected from approximately 10:00 a.m. – 4:30 p.m. on Wednesday April 20, and Thursday April 21, 2011. Operating conditions for heating and ventilation during the air testing were standard for winter conditions in accordance with the current IEQ management plan included as part of the O&M Plan. The thermostat in each room was set to 70 degrees Fahrenheit.

As shown in Table 1, PCB concentrations in indoor air of the rooms tested ranged from 24 nanograms per cubic meter ( $\text{ng m}^3$ ) to 176  $\text{ng m}^3$ . These PCB concentrations are less than the most conservative (i.e., most health protective) annual average target levels for all ages determined by the site-specific assessment (230  $\text{ng m}^3$ ). In addition, these concentrations are well below the public health levels for annual average concentrations suggested by the U.S. Environmental Protection Agency (EPA) for children older than 6 years (300  $\text{ng m}^3$ ) and adults (450  $\text{ng m}^3$ ). In addition, ten out of the fourteen rooms tested were less than the EPA's suggested annual average levels for children less than 6 years old (100  $\text{ng m}^3$ ).

**Table 1** Air Sample Results for Total Polychlorinated Biphenyls, Estabrook Elementary School, 117 Grove Street, Lexington, Massachusetts, July 22, 2010 – April 21 and 22, 2011\*

Sample Location	Total PCBs (ng/m <sup>3</sup> )													
	Round 1 <sup>a</sup>	Round 2 <sup>b</sup>	Round 3 <sup>c</sup>	Round 4 <sup>d</sup>	Round 5 <sup>e</sup>	Round 6 <sup>f</sup>	Round 7 <sup>g</sup>	Round 8 <sup>h</sup>	Round 9 <sup>i</sup>	Round 10 <sup>j</sup>	Round 11 <sup>k</sup>	Round 12 <sup>l</sup>	Round 13 <sup>m</sup>	Round 14 <sup>n</sup>
Room 1	299	426	118 <sup>†</sup>	63 <sup>†</sup>	76 <sup>†</sup>	153 <sup>†</sup>	145	–	116	–	–	–	146	–
Room 2	–	775	455	189	166	253 <sup>†</sup>	53	–	60	–	–	–	–	136
Room 3	–	–	–	–	–	364 <sup>†</sup>	111	–	110	–	–	–	–	44
Room 4	–	–	–	–	–	344 <sup>†</sup>	126	105	–	–	–	–	–	–
Room 5	459	736	320	196	149	209 <sup>†</sup>	67 – 90	–	128	–	–	–	–	–
Room 6	1,800	764	483	171	213	383 <sup>†</sup>	182	118 – 144	–	–	–	–	97	–
Room 7A	–	–	5.19	–	–	–	–	–	–	–	34	–	–	15
Room 7B	–	–	–	–	–	–	–	–	–	–	<5.3	–	–	57
Room 7C	–	–	–	–	–	–	–	–	–	–	–	–	11-15	–
Room 11	–	–	–	–	–	–	–	–	65	–	–	–	–	–
Room 13	319	340	184	155 <sup>†</sup>	–	–	–	–	89 – 94	–	–	–	94	–
Room 19	–	–	–	–	–	–	–	–	12	–	–	–	–	–
Room 20	–	–	–	–	–	–	–	–	–	57	–	–	–	157-176
Room 21A	–	–	410	193	–	–	–	–	–	–	–	109	103	–
Room 21B	–	–	–	–	–	–	–	–	–	188	–	–	–	–
Room 22	–	–	–	–	–	–	–	–	–	25	–	–	–	–
Room 23	–	–	–	–	–	–	–	–	–	142	–	–	–	68-117
Room 24	680	601	226	173 <sup>†</sup>	–	–	–	–	–	105 – 107	–	–	86	–
Room 25	–	–	–	–	–	–	–	–	–	130	–	–	–	135
Room 26	–	–	–	79	–	–	–	–	–	–	47	–	–	–
Room 27	–	–	–	–	–	–	–	–	–	–	69	–	–	–
Room 31A	562	575	444	–	–	282	–	–	–	94	–	–	–	97
Room 31B	–	–	–	–	–	–	–	–	–	135	–	–	–	52
Room 39B	–	419	–	–	–	–	–	–	–	64	–	–	–	–
Room 39C	342	495	245	100	–	–	–	–	–	125	–	–	76	–
Library	–	469	196	–	–	–	–	–	–	–	135	–	–	–
Art/Music Room	–	–	194	–	–	–	–	–	–	–	–	30	–	61
Teacher Work Room	–	–	138	–	–	–	–	–	–	–	34	–	–	–
Admin. Offices	–	–	–	–	–	–	–	–	–	–	72	66	–	55-73
Teacher Lounge	–	–	–	–	–	–	–	–	–	89	–	–	–	–
Basement	–	–	227	–	–	–	–	–	–	–	–	–	–	–

**Table 1** Continued

Sample Location	Total PCBs (ng/m <sup>3</sup> )													
	Round 1 <sup>a</sup>	Round 2 <sup>b</sup>	Round 3 <sup>c</sup>	Round 4 <sup>d</sup>	Round 5 <sup>e</sup>	Round 6 <sup>f</sup>	Round 7 <sup>g</sup>	Round 8 <sup>h</sup>	Round 9 <sup>i</sup>	Round 10 <sup>j</sup>	Round 11 <sup>k</sup>	Round 12 <sup>l</sup>	Round 13 <sup>m</sup>	Round 14 <sup>n</sup>
Ceiling plenum (39C)	–	–	562	–	–	–	–	–	–	–	–	–	–	–
Psychologist Office	–	–	–	–	–	253	–	–	–	–	–	–	–	–
Gym	–	–	–	–	–	–	–	–	–	–	–	38	–	29
Sped Office	–	–	–	–	–	–	–	–	–	–	–	134	–	86
Room B	–	–	–	–	–	–	–	–	–	–	–	148	–	–
Kitchen	–	–	–	–	–	–	–	–	–	–	–	66	–	24
Room D	–	–	–	–	–	–	–	–	–	–	–	108	–	–
Hall Office (Outside Art)	–	–	–	–	–	–	–	–	–	–	–	125	–	–
Outdoors	<3.79	<5.00	<4.20	<4.46	<4.32	<4.44	<5.54	<4.58	<4.60	<4.08	<5.32	<5.95	<4.37	<5.31

PCB polychlorinated biphenyl  
 ng/m<sup>3</sup> nanograms per cubic meter  
 – air sample not collected at that location

<sup>a</sup> Round 1 samples collected July 22, 2010, during summer conditions.

<sup>b</sup> Round 2 samples collected on August 25, 26, or 27, 2010, following removal of caulk around exterior window frame.

<sup>c</sup> Round 3 samples collected on September 6, 2010, following initial optimization of outdoor air delivery and central exhaust, unless otherwise noted.

<sup>d</sup> Round 4 samples collected on September 19, 2010, under optimization of outdoor air delivery and central exhaust, and indoor caulk encapsulation, unless otherwise noted.

<sup>e</sup> Round 5 samples collected on September 27, 2010, under optimization of outdoor air delivery and central exhaust, partial indoor caulk encapsulation, and isolation of ceiling tiles.

<sup>f</sup> Round 6 samples collected on September 29, 2010, under reduced outdoor air delivery, central exhaust, full indoor caulk encapsulation, and isolation of ceiling tiles.

<sup>g</sup> Round 7 samples collected on October 18 and 19, 2010, under isolation, encapsulation and air cleaner configurations.

<sup>h</sup> Round 8 samples collected on November 4, 2010, under winter outdoor air delivery, mini-wall, and full indoor caulk encapsulation.

<sup>i</sup> Round 9 samples collected on November 11, 2010, under winter outdoor air delivery, mini-wall, and full indoor caulk encapsulation.

<sup>j</sup> Round 10 samples collected on November 20, 2010, under winter outdoor air delivery, mini-wall, and full indoor caulk encapsulation.

<sup>k</sup> Round 11 samples collected on November 24, 2010, under winter outdoor air delivery, mini-wall, and full indoor caulk encapsulation.

<sup>l</sup> Round 12 samples collected on December 2, 2010, under winter outdoor air delivery, mini-wall, and full indoor caulk encapsulation.

<sup>m</sup> Round 13 samples collected on February 23, 2011, under winter outdoor air delivery, mini-wall, and full indoor caulk encapsulation.

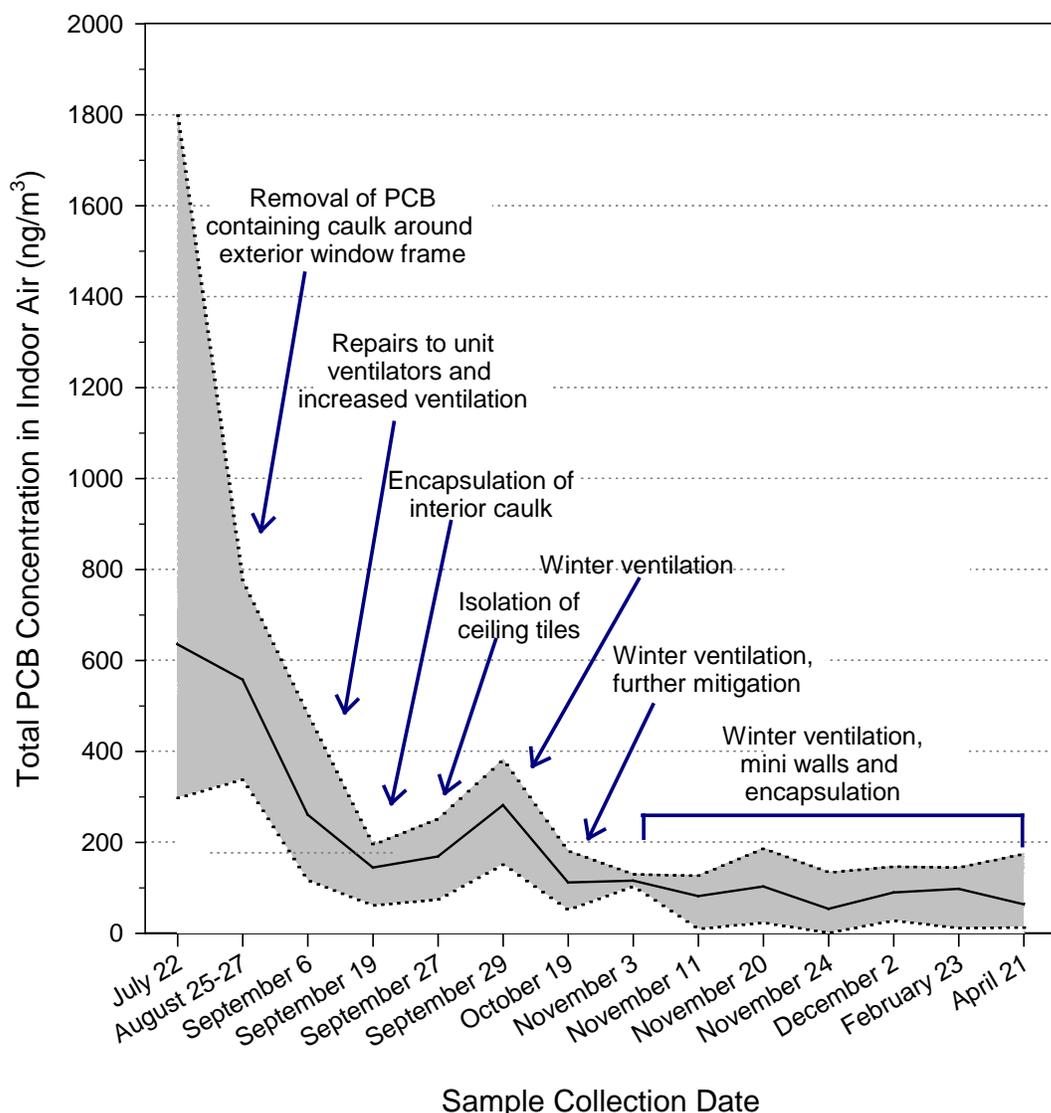
<sup>n</sup> Round 14 samples collected on April 21 and 22, 2011, under winter outdoor air delivery, mini-wall, and full indoor caulk encapsulation.

\* PCB concentration analysis performed by Alpha Analytical Inc., using U.S. Environmental Protection Agency (EPA) Method 10A (GC/MS-SIM).

† Samples collected under minimum outdoor air delivery.

‡ Sample collected with supplemental air outdoor air (1,200 cubic feet per minute).

A graphical summary of the PCB concentration measured in indoor air at Estabrook between July 22 and April 21, 2011, is provided in Figure 1. Indoor air PCB levels measured during Round 14 were significantly lower than in Round 1. Similarly, a 2-fold decrease in average concentrations has been achieved since winter ventilation conditions began in late September. These observations continue to demonstrate the effectiveness of the mitigation methods employed in Estabrook.



**Figure 1** Average (line) and Range (shaded area) of Total PCB Concentration in Indoor Air over Time

If you have any questions regarding this memorandum please do not hesitate to contact us at 1-800-TALK EHE (1-800-825-5343).